

Claims

What is claimed is:

1. A swaging apparatus structured to be operatively mounted to an actuator, the swaging apparatus being structured to swage together a first member and a second member, the swaging apparatus comprising:
 - a support structured to be disposed on the actuator;
 - a mandrel including a plurality of substantially planar engagement surfaces;
 - a collet structured to be disposed on the actuator;
 - the collet including a base and a plurality of segments, the segments being disposed on the base and being elastically deflectable with respect to the base;
 - each segment including a substantially planar reaction surface and an arcuate swaging surface;
 - the engagement surfaces being slidably engageable with the reaction surfaces to deflect the segments between a collapsed position and an extended position, the segments in the extended position being structured to swagingly engage the first member; and
 - the mandrel being rotatably disposed on the support, whereby the engagement surfaces are self-alignable with the reaction surfaces, the engagement surfaces being disposed on the mandrel generally opposite the support.
2. The swaging apparatus of Claim 1, wherein the segments are biased toward the collapsed position.
3. The swaging apparatus of Claim 2, wherein the collet includes a biasing member that biases the segments toward the collapsed position.
4. The swaging apparatus of Claim 1, wherein the collet includes a hollow spacer having a positioning surface;

the spacer being disposed on the base;
the segments extending through at least a portion of the spacer and protruding outwardly from the positioning surface; and
the positioning surface being structured to be receivable against one of the first and second members to position the segments with respect to the first member.

5. The swaging apparatus of Claim 1, wherein
the mandrel includes a head;
the support including a collar;
at least a portion of the mandrel extending through the collar; and
the collar retaining the head rotatably mounted to the support.

6. The swaging apparatus of Claim 1, wherein
at least a portion of the mandrel in the vicinity of the engagement surfaces has a cross sectional shape substantially of a regular polygon.

7. The swaging apparatus of Claim 1, wherein
the swaging surfaces extend along an imaginary circle when the segments are in the extended position.

8. The swaging apparatus of Claim 1, wherein
one of the mandrel and the collet is movable with respect to the other of the mandrel and the collet between a first position and a second position, the engagement surfaces being disengaged from the reaction surfaces and the segments being in the collapsed position when the one of the mandrel and the collet is in the first position, the engagement surfaces being engaged with the reaction surfaces and the segments being in the extended position when the one of the mandrel and the collet is in the second position.

9. A machine for swaging together a first member and a second member, the machine comprising:

- an actuator including a housing and a translatable piston;
- a swaging apparatus operatively mounted to the actuator;
- the swaging apparatus including a support, a mandrel, and a collet;
- the support being disposed on one of the housing and the piston;
- the collet being disposed on the other of the housing and the piston;
- the collet including a base and a plurality of segments, the segments being disposed on the base and being elastically deflectable with respect to the base;
- each segment including a substantially planar reaction surface and an arcuate swaging surface;
- the mandrel including a plurality of substantially planar engagement surfaces;
- the engagement surfaces being slidably engageable with the reaction surfaces to deflect the segments between a collapsed position and an extended position, the segments in the extended position being structured to swagingly engage the first member; and
- the mandrel being rotatably disposed on the support, whereby the engagement surfaces are self-alignable with the reaction surfaces, the engagement surfaces being disposed on the mandrel generally opposite the support.

10. The machine of Claim 9, wherein
the segments are biased toward the collapsed position.

11. The machine of Claim 10, wherein
the collet includes a biasing member that biases the segments toward the collapsed position.

12. The machine of Claim 9, wherein
the collet includes a hollow spacer having a positioning surface;
the spacer being disposed on the base;

the segments extending through at least a portion of the spacer and protruding outwardly from the positioning surface;

the positioning surface being structured to be receivable against one of the first and second members to position the segments with respect to the first member.

13. The machine of Claim 9, wherein

the mandrel includes a head;

the support including a collar;

at least a portion of the mandrel extending through the collar; and

the collar retaining the head rotatably mounted to the support.

14. The machine of Claim 9, wherein

at least a portion of the mandrel in the vicinity of the engagement surfaces has a cross sectional shape substantially of a regular polygon.

15. The machine of Claim 9, wherein

the swaging surfaces extend along an imaginary circle when the segments are in the extended position.

16. The machine of Claim 9, wherein

one of the mandrel and the collet is movable with respect to the other of the mandrel and the collet between a first position and a second position, the engagement surfaces being disengaged from the reaction surfaces and the segments being in the collapsed position when the one of the mandrel and the collet is in the first position, the engagement surfaces being engaged with the reaction surfaces and the segments being in the extended position when the one of the mandrel and the collet is in the second position.

17. A method of swaging together a first member and a second member, the method comprising:

providing a mandrel having a plurality of substantially planar engagement surfaces;

providing a collet having a plurality of deflectable segments, each segment having a substantially planar reaction surface and an arcuate swaging surface;

establishing slidable engagement of the engagement surfaces with the reaction surfaces through self-alignment to elastically deflect the segments between a collapsed position and an extended position; and

swagingly engaging the swaging surfaces with the first member.

18. The method of Claim 17 wherein

self-alignment is permitted through rotation of one of the mandrel and the collet with respect to the other.

19. A machine for swaging together a first member and a second member, the machine comprising:

an actuator including a housing and a translatable piston;

a swaging apparatus operatively mounted to the actuator;

the swaging apparatus including a support, a mandrel, and a collet;

the support being disposed on one of the housing and the piston;

the collet being disposed on the other of the housing and the piston, the collet being rotatably adjustable among a plurality of rotational positions with respect to the other of the housing and the piston;

the collet including a base and a plurality of segments, the segments being disposed on the base and being elastically deflectable with respect to the base;

each segment including a substantially planar reaction surface and a swaging surface;

the mandrel including a plurality of substantially planar engagement surfaces;

the engagement surfaces being slidably engageable with the reaction surfaces to deflect the segments between a collapsed position and an extended position, the segments in the extended position being structured to swagingly engage the first member; and

the mandrel being rotatably disposed on the support and self-alignable with the reaction surfaces according to the rotational position of the collet with respect to the other of the housing and the piston.

20. The machine of Claim 19 wherein

the collet is threadably adjustable among the plurality of rotational positions with respect to the other of the housing and the piston.

21. The machine of Claim 20 wherein

the collet is lockable in at least one of the plurality of rotational positions with respect to the other of the housing and the piston.

22. The machine of Claim 19 wherein

the collet is substantially continuously adjustable among the plurality of rotational positions with respect to the other of the housing and the piston.

23. The machine of Claim 19 wherein

the machine is a substantially mobile handheld device.